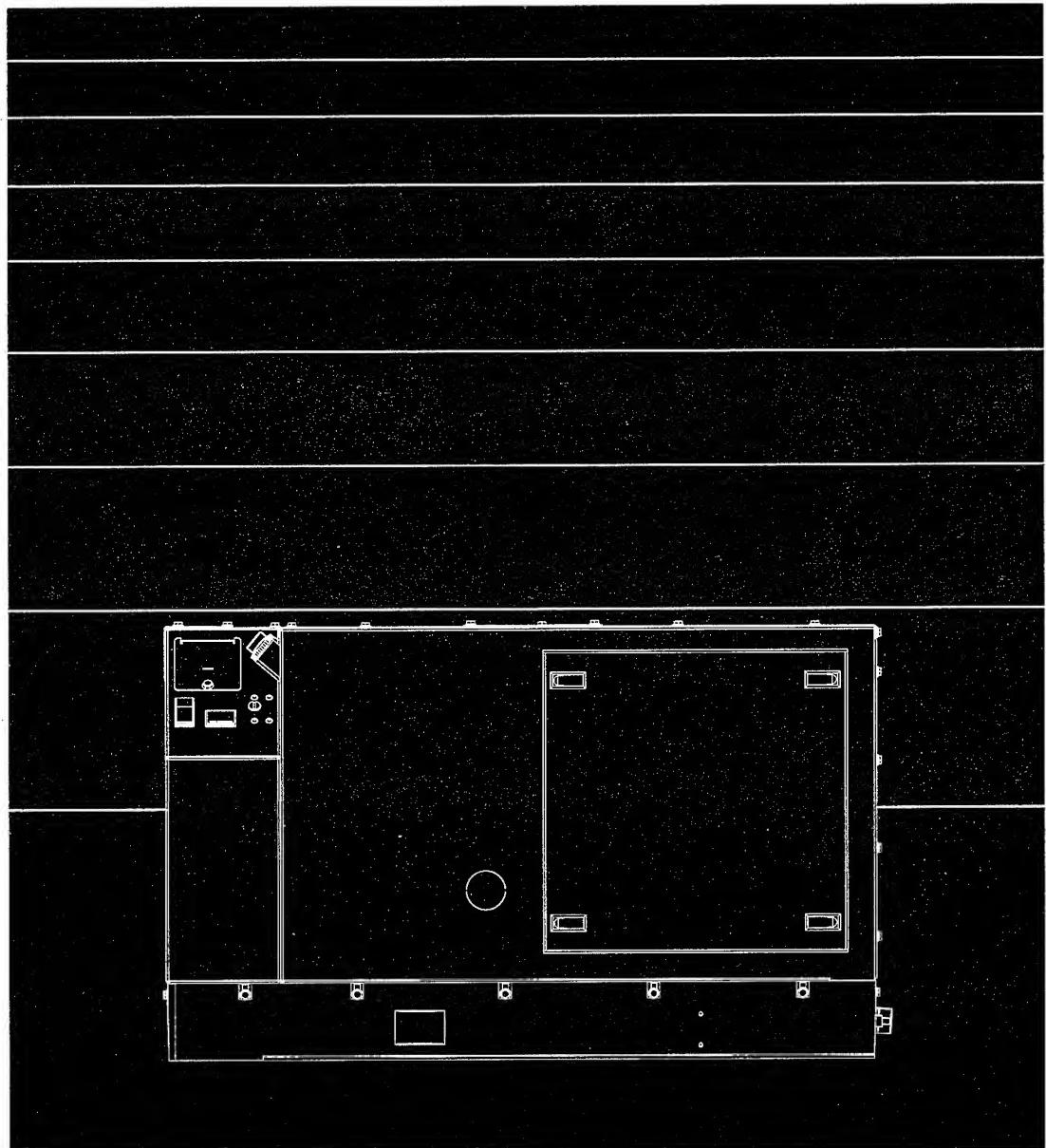


**Onan Mobile GenSet**

**Installation Manual**

**HDKAJ, HDKAK, HDKAT**

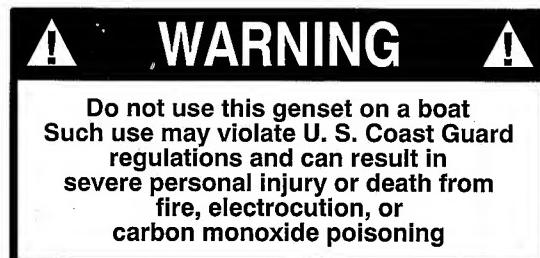


Printed in U.S.A.

981-0623  
8-99

**California**  
**Proposition 65 Warning**

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.



# Table of Contents

---

<b>SAFETY PRECAUTIONS .....</b>	<b>2</b>
<b>INTRODUCTION .....</b>	<b>4</b>
About this Manual .....	4
Installation Codes and Standards for Safety .....	4
<b>LOCATION, MOUNTING AND ENCLOSURE .....</b>	<b>5</b>
<b>EXHAUST CONNECTIONS .....</b>	<b>12</b>
<b>FUEL CONNECTIONS .....</b>	<b>15</b>
<b>ELECTRICAL CONNECTIONS .....</b>	<b>16</b>
Generator Connections .....	16
Remote Control Connections .....	18
Battery Connections .....	19
<b>SPECIFICATIONS .....</b>	<b>21</b>
<b>INSTALLATION REVIEW AND STARTUP .....</b>	<b>22</b>
Installation Review .....	22
Startup .....	22
Temperature Test .....	23
<b>OUTLINE DRAWINGS .....</b>	<b>25</b>

# Safety Precautions

Thoroughly read the OPERATOR'S MANUAL before operating the genset. Safe operation and top performance can only be obtained when equipment is operated and maintained properly.

The following symbols in this manual alert you to potential hazards to the operator, service person and equipment.

**DANGER** *alerts you to an immediate hazard which will result in severe personal injury or death.*

**WARNING** *alerts you to a hazard or unsafe practice which can result in severe personal injury or death.*

**CAUTION** *alerts you to a hazard or unsafe practice which can result in personal injury or equipment damage.*

Electricity, fuel, exhaust, moving parts and batteries present hazards which can result in severe personal injury or death.

## GENERAL PRECAUTIONS

- Keep ABC fire extinguishers handy.
- Make sure all fasteners are secure and torqued properly.
- Keep the genset and its compartment clean. Excess oil and oily rags can catch fire. Dirt and gear stowed in the compartment can restrict cooling air.
- Let the engine cool down before removing the coolant pressure cap or opening the coolant drain. Hot coolant under pressure can spray out and cause severe burns.
- Before working on the genset, disconnect the negative (–) battery cable at the battery to prevent starting.
- Use caution when making adjustments while the genset is running—hot, moving or electrically live parts can cause severe personal injury or death.

• Used engine oil has been identified by some state and federal agencies as causing cancer or reproductive toxicity. Do not ingest, inhale, or contact used oil or its vapors.

- Benzene and lead in some gasolines have been identified by some state and federal agencies as causing cancer or reproductive toxicity. Do not to ingest, inhale or contact gasoline or its vapors.
- Do not work on the genset when mentally or physically fatigued or after consuming alcohol or drugs.
- Carefully follow all applicable local, state and federal codes.

## GENERATOR VOLTAGE IS DEADLY!

- Generator output connections must be made by a qualified electrician in accordance with applicable codes.
- The genset must not be connected to the public utility or any other source of electrical power. Connection could lead to electrocution of utility personnel and damage to equipment. An approved switching device must be used to prevent interconnections.
- Use caution when working on live electrical equipment. Remove jewelry, make sure clothing and shoes are dry and stand on a dry wooden platform.

## ENGINE EXHAUST IS DEADLY!

- Learn the symptoms of carbon monoxide poisoning in this manual and never sleep in the vehicle while the genset is running unless the vehicle is equipped with a working carbon monoxide detector.
- The exhaust system must be installed in accordance with the genset Installation Manual. Engine cooling air must not be used for heating the working or living space or compartment.
- Inspect for exhaust leaks at every startup and after every eight hours of running.
- Make sure there is ample fresh air when operating the genset in a confined area.

## **FUEL IS FLAMMABLE AND EXPLOSIVE**

- Do not smoke or turn electrical switches ON or OFF where fuel fumes are present or in areas sharing ventilation with fuel tanks or equipment. Keep flame, sparks, pilot lights, arc-producing equipment and all other sources of ignition well away.
- Fuel lines must be secured, free of leaks and separated or shielded from electrical wiring.

## **BATTERY GAS IS EXPLOSIVE**

- Wear safety glasses and do not smoke while servicing batteries.
- When disconnecting or reconnecting battery cables, always disconnect the negative (–) battery cable first and reconnect it last to reduce arcing.

## **MOVING PARTS CAN CAUSE SEVERE PERSONAL INJURY OR DEATH**

- Do not wear loose clothing or jewelry near moving parts such as PTO shafts, fans, belts and pulleys.

- Keep hands away from moving parts.

- Keep guards in place over fans, belts, pulleys, etc.

## **DO NOT OPERATE IN FLAMMABLE AND EXPLOSIVE ENVIRONMENTS**

Flammable vapor can cause a diesel engine to overspeed and become difficult to stop, resulting in possible fire, explosion, severe personal injury and death. ***Do not operate a diesel-powered genset where a flammable vapor environment can be created by fuel spill, leak, etc., unless the genset is equipped with an automatic safety device to block the air intake and stop the engine.*** The owners and operators of the genset are solely responsible for operating the genset safely. Contact your authorized Onan/Cummins dealer or distributor for more information.

# Introduction

## ABOUT THIS MANUAL

This manual is a guide for the installation of the HDKAJ, HDKAK and HDKAT Series of generator sets (gensets). Proper installation is essential for safe, reliable and quiet operation. Read through this manual before starting the installation. Keep this manual and the Operator's Manual with the other vehicle manuals.

This manual addresses the following aspects of the installation:

- Location, Mounting and Enclosure
- Exhaust Connections
- Fuel Connections
- Electrical Connections
- Startup

**WARNING** *Improper installation can result in severe personal injury, death and equipment damage. The installer must be qualified to perform the installation of electrical and mechanical equipment.*

**CAUTION** *Unauthorized modifications or replacement of fuel, exhaust, air intake or speed control system components that affect engine emissions are prohibited by law in the State of California.*

See the Operator's Manual for operation and maintenance and the Service Manual for service.

**Note: Manuals are updated from time-to-time to reflect changes in the equipment and its specifications. For this reason, only the copy of the installation manual supplied with the genset should be used as a guide for the installation.**

## INSTALLATION CODES AND STANDARDS FOR SAFETY

The builder of the RV or work vehicle bears sole responsibility for the selection of the appropriate genset, for its proper installation and for obtaining approvals from the authorities (if any) having jurisdiction over the installation. These sets meet the basic requirements of the Standard for Safety for Engine Generator Sets for Recreational Vehicles, ANSI/RVIA EGS-1. They are suitable for installation in accordance with:

- NFPA No. 70, Article 551—Recreational Vehicles and RV Parks
- ANSI A119.2 (NFPA No. 501C)—Recreational Vehicles
- CSA Electrical Bulletin 946—Requirements for Internal Combustion Engine-Driven Electric Generators for Use in Recreational Vehicles

Federal, State and local codes, such as the California Administrative Code—Title 25 (RV installation), might also be applicable. Installation codes and recommendations can change from time-to-time and are different in different countries, states and municipalities. Obtain the standards in Table 1 for reference.

TABLE 1. REFERENCE CODES AND STANDARDS

NFPA No. 70 NFPA NO. 501C	National Fire Protection Association 470 Atlantic Avenue Boston, MA 02210
ANSI A119.2 ANSI/RVIA-EGS-1 FMVSS 301	Recreational Vehicle Industry Association 14650 Lee Road Chantilly, VA 22021
California Adminis-trative Code—Title 25, Chapter 3	State of California Documents Section P.O. Box 1015 North Highlands, CA 95660
CAN/CSA-Z240 Recreational Vehicles Bulletin 946	Canadian Standards Association Housing and Construction Materials Section 178 Rexdale Blvd. Rexdale, Ontario, Canada M9W 1R3

# Location, Mounting and Enclosure

The location, mounting and enclosure of a genset must be such that mounting is secure, engine exhaust and fuel vapors are prevented from entering the vehicle, cooling air flow is not restricted, and ready access is afforded for operating the genset and performing periodic maintenance. Figure 1 illustrates typical genset installations. Commercial Model HDKAT gensets are suitable for typical commercial vehicles applications, as shown, as well as RV-style applications.

1. Orient the genset so that the operator's console will be outboard and accessible. There should be easy access for starting and stopping the genset, resetting the circuit breaker(s), checking and replenishing engine oil and coolant, replacing the fuses on the back of the access panel on the console and withdrawing the coolant system pressure cap and fill hose. For Model HDKAT, provide access to the side service door (Figure 21) and air filter. (A Remote Air Cleaner Kit 541-0531 is available from Onan for Model HDKAT).
2. Locate the genset so that there is sufficient access for battery, fuel, exhaust, remote control and AC connections. *The exhaust tailpipe must not terminate underneath the vehicle and must be visible and accessible along its whole length for inspection and replacement.*
3. Support the genset on a structure able to resist the dynamic weight of the genset (420 lbs [191 kg]):  $\pm 3$  g-force ( $\pm 1260$  lbf) vertical and  $\pm 1$  g-force ( $\pm 420$  lbf) horizontal. The genset is shipped with four 3/8-16 by 1-1/2 inch thread-forming screws to secure it to the supporting frame or floor.
4. Provide at least 0.5 inch (12.7 mm) clearance to the top and 0.25 inch (6.4 mm) clearance to the sides of the genset. See Figure 2. At these

**WARNING Design the genset support structure carefully to prevent the genset from falling from the vehicle and possibly causing a serious road accident.**

clearances, minimum compartment dimensions are:

Height: 22.78 inches (578.6 mm)

Width: 24.73 inches (628.1 mm)

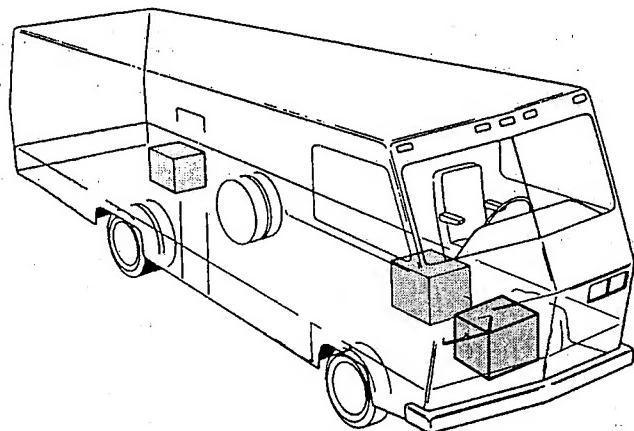
Length: 36.85 inches (936 mm)

5. If the genset is mounted on the floor of the coach in a compartment inside the envelope of the living space or cab, provide a vapor-tight, fire-resistive compartment of 26 gauge galvanized steel or equivalent to isolate the genset from the vehicle interior. Do not duct genset cooling air, which can include exhaust gases, into the vehicle for heating.

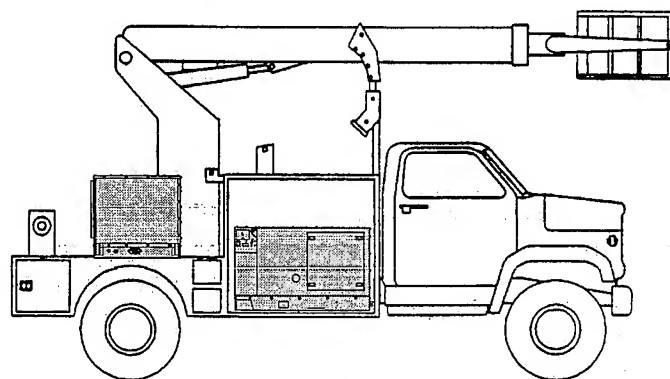
**WARNING EXHAUST GAS AND FIRE ARE DEADLY! — Install a vapor-tight and fire-resistant barrier of approved materials between the genset and the vehicle interior. — Do not duct genset cooling air into the vehicle for heating.**

6. Provide cutout openings in a compartment floor that are at least as large as the cooling air inlet and outlet openings in the bottom of the genset (shaded areas in Figure 2). **Frame cross members must NOT cut across the openings.**
7. Make sure that vehicle components located below the genset, including the genset exhaust tailpipe, will not interfere with draining coolant, engine oil and removing the oil and fuel filters. The maintenance door in the base of the genset must be able to swing open a full 90 degrees without interference (Models HDKAJ and HDKAK). (See shaded area in Figure 2 for cut-out area.)
8. Provide access for removing the two fuel pump mounting screws so that the genset does not have to be removed to replace a fuel pump. See Figure 2.
9. Locate or shield the genset such that condensate from air conditioners will not drip on it.
10. Provide protection from direct road splash if the genset is located behind a road wheel.

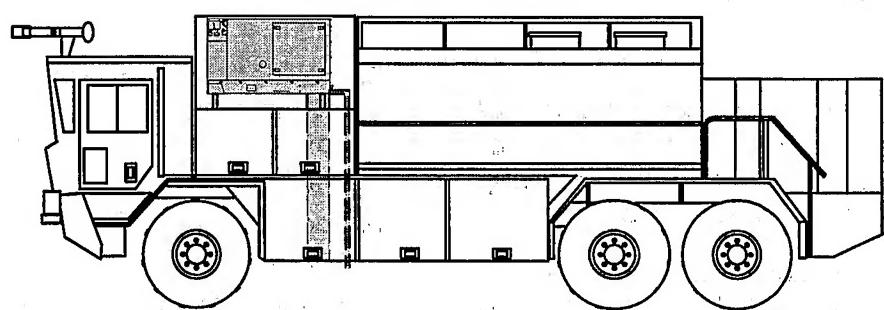
**—TYPICAL RV INSTALLATIONS—**



**—TYPICAL COMMERCIAL VEHICLE INSTALLATIONS OF MODEL HDKAT—**



**TYPICAL "HIGH MOUNT"**



**FIGURE 1. TYPICAL GENSET INSTALLATIONS**

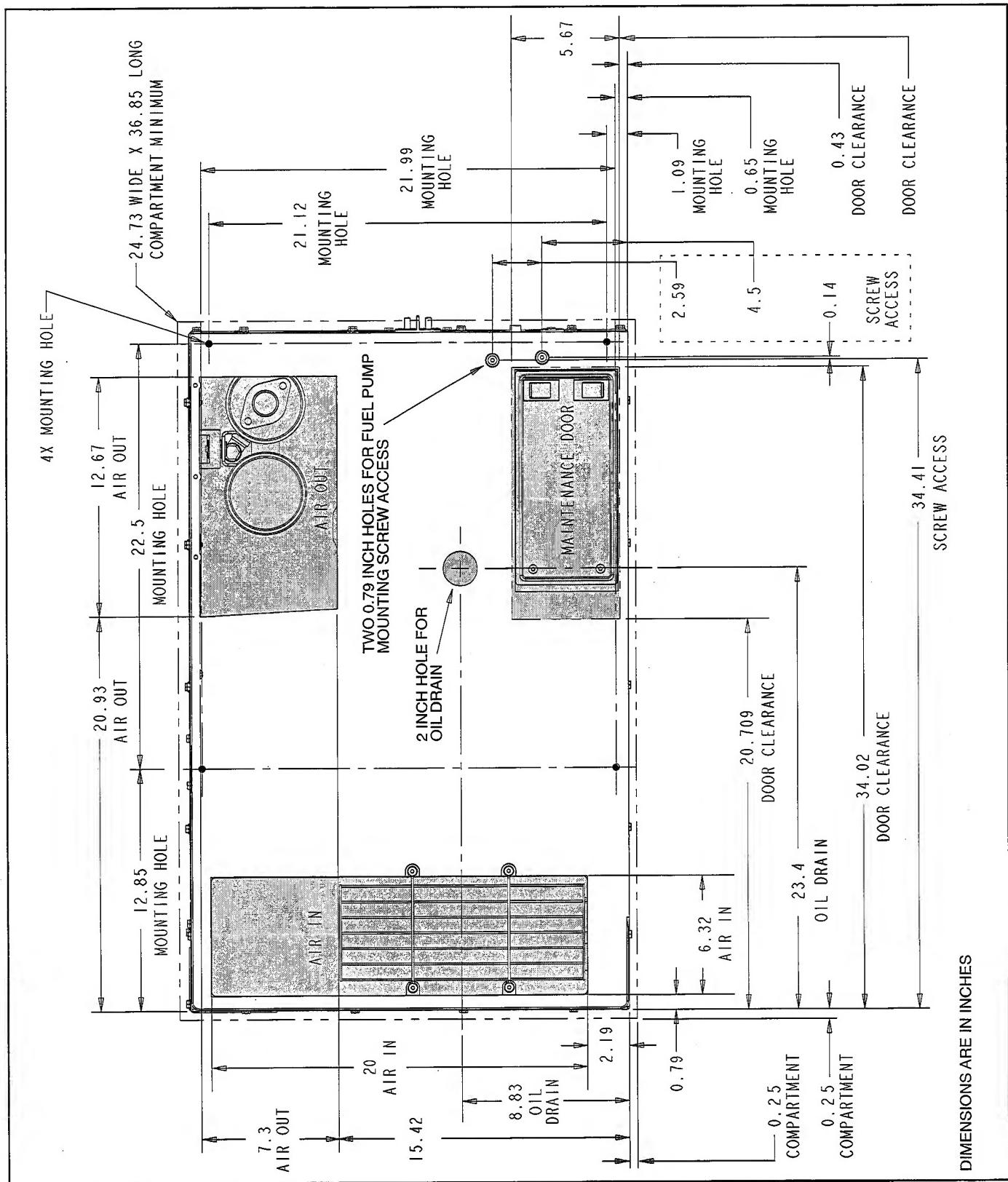


FIGURE 2. FLOOR PLAN

## **High Mount Installations**

If the genset is to be mounted high on the vehicle (Model HDKAT only), consider the following:

1. The maximum fuel pump lift is 36 inches (914.4 mm). An additional fuel pump must be used for generator sets mounted more than 36 inches (914.4 mm) above the fuel source. Auxiliary Fuel Pump Kit 541-0530 is available from Onan.
  2. Provide 2.5 inches (63.5 mm) minimum clearance to the sides and rear of the genset, and 0.25 inch (6.35 mm) clearance to the front of the genset. This area provides the genset's intake air for cooling.
  3. Risers must be fabricated to raise and support the genset above the compartment floor. This area provides the genset's intake air for cooling
- (Figures 3 and 4). At these clearances, minimum compartment dimensions are:
- Width: 24.98 inches (634.5 mm)
- Length: 41.35 inches (1050.3 mm)
4. Ducting must be fabricated to exhaust hot air from the genset. Foam or gasket material must be used between the duct and the base of the set to prevent recirculating of exhausted hot air. See Figures 4 and 5.
  5. The exhaust tailpipe must be routed down and underneath the vehicle and terminate at least 1 inch (25.4 mm) beyond the perimeter of the vehicle (Page 13). The tail pipe may be routed inside the hot exhaust duct (Page 10), but not through the interior of the vehicle. The tail pipe must be visible and accessible along its entire length for inspection and replacement.

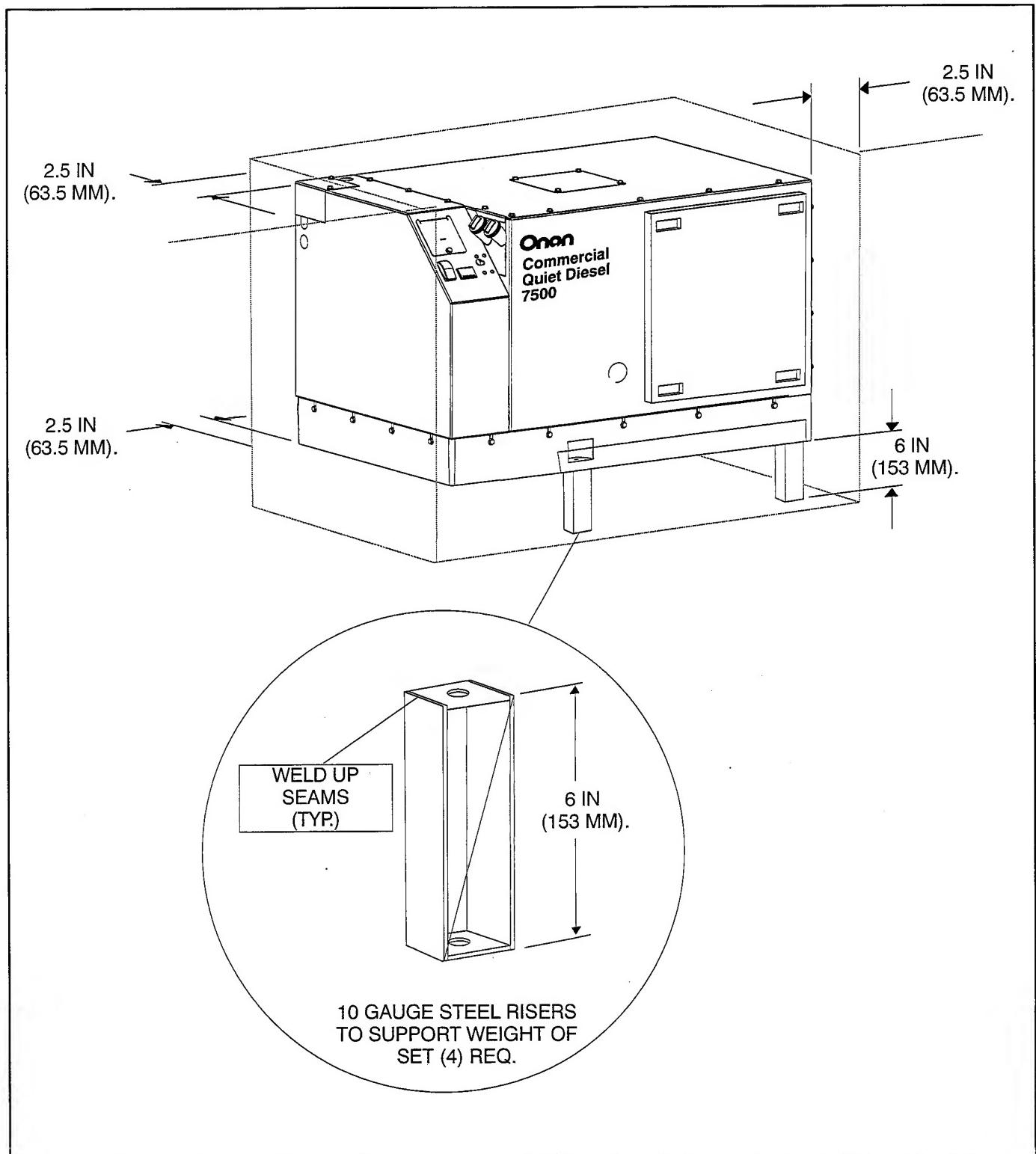
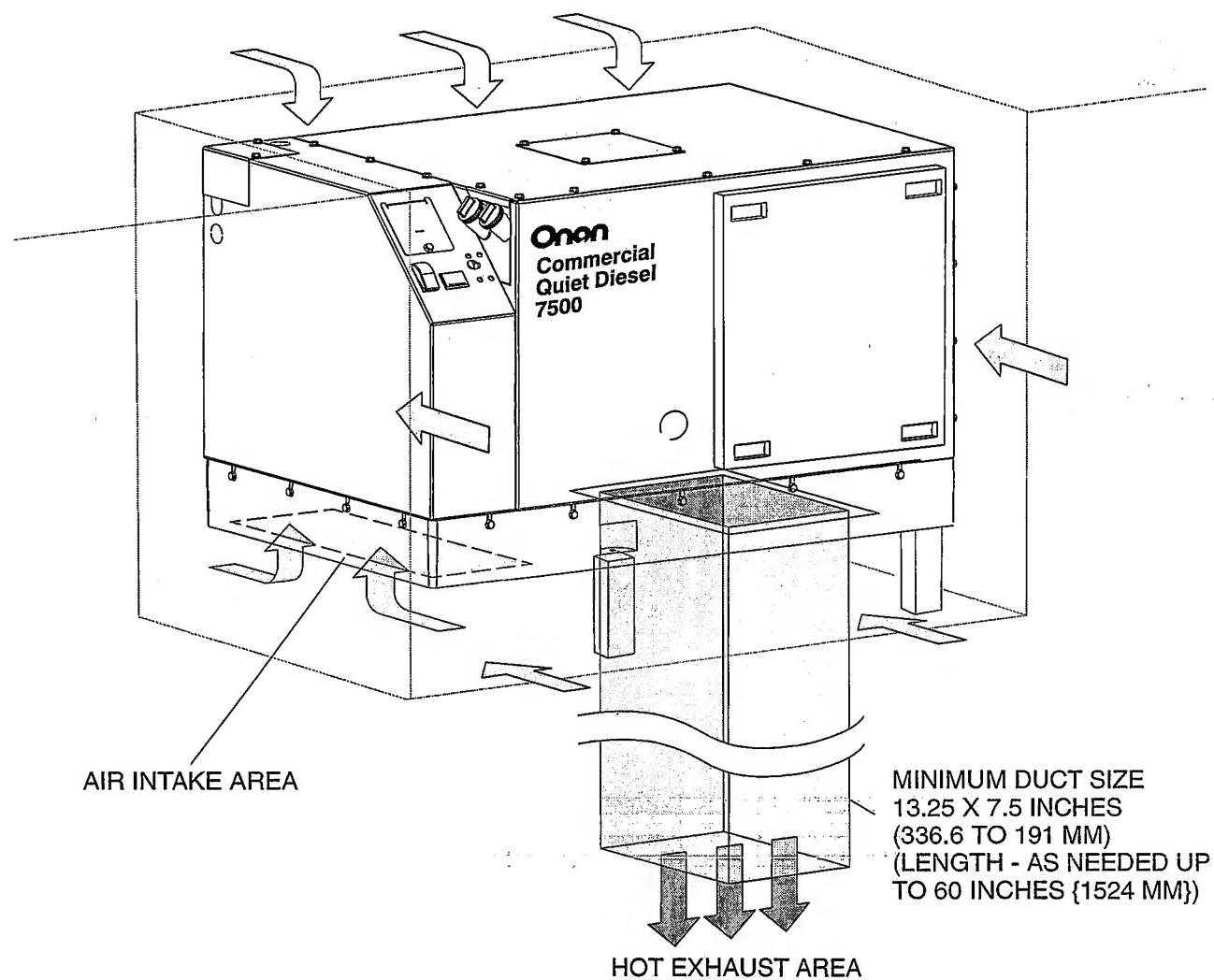


FIGURE 3. HIGH MOUNT INSTALLATION (MODEL HDKAT ONLY)



**NOTES:**

- Keep exhausted air away from intake air.
- Test for recirculating air (See Onan Installation Manual 981-0632).
- Use foam/gasketing material to seal duct to base of set.

**FIGURE 4. INTAKE AIR – EXHAUST AIR DUCTING (MODEL HDKAT ONLY)**

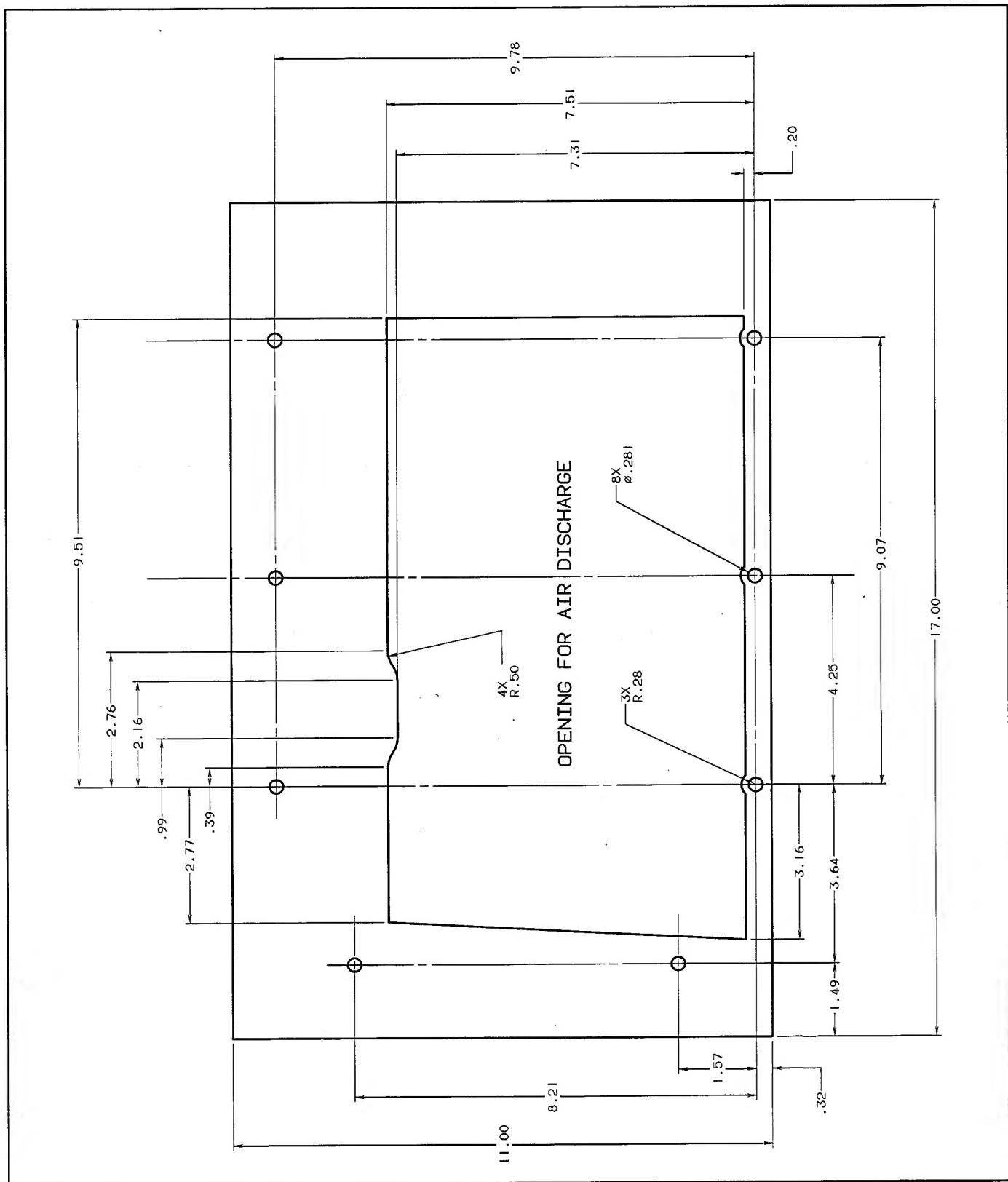


FIGURE 5. EXHAUST AIR OUTLINE DRAWING

# Exhaust Connections

The exhaust system must be gas-tight and designed to limit entry of exhaust gases into the vehicle.

**WARNING EXHAUST GAS IS DEADLY!** Keep exhaust gases from entering the vehicle. Do not terminate the exhaust tailpipe underneath the vehicle or closer than specified to openings into the vehicle (Figure 9) or route it such that it is likely to be damaged (Figure 10). Use approved materials and parts only.

The muffler is mounted inside the genset housing and has a flanged outlet opening (Figure 6). The muffler is approved by the U.S. Forest Service as a spark-arrest muffler. (Failure to provide and maintain a spark arrester can be a violation of the law.) Liability for damage, injury and warranty expense due to the modification of the exhaust system or due to the use of unapproved parts becomes the responsibility of the person performing the modification or installing the unapproved parts. Contact an

Onan distributor for approved exhaust system parts.

Tailpipe adapter kits are separately available. Use a straight adapter for a tailpipe routed up from below the genset. Use an elbow adapter for a tailpipe routed through the clearance hole in the right or back side of the base of the genset. When connecting and routing the tailpipe:

1. Do not connect the genset to the vehicle engine exhaust system.

**CAUTION** Interconnecting the engine exhaust systems will allow exhaust condensates and soot to migrate into the engine that is idle, causing engine damage.

2. Use 1-3/8 inch ID, 18-gauge aluminized steel tubing or equivalent for the tailpipe. (Do not use flexible pipe. Flexible pipe is not gas tight or durable.)
3. Secure the tailpipe or adapter flange to the muffler flange with a gasket and two 5/16-18 bolts.

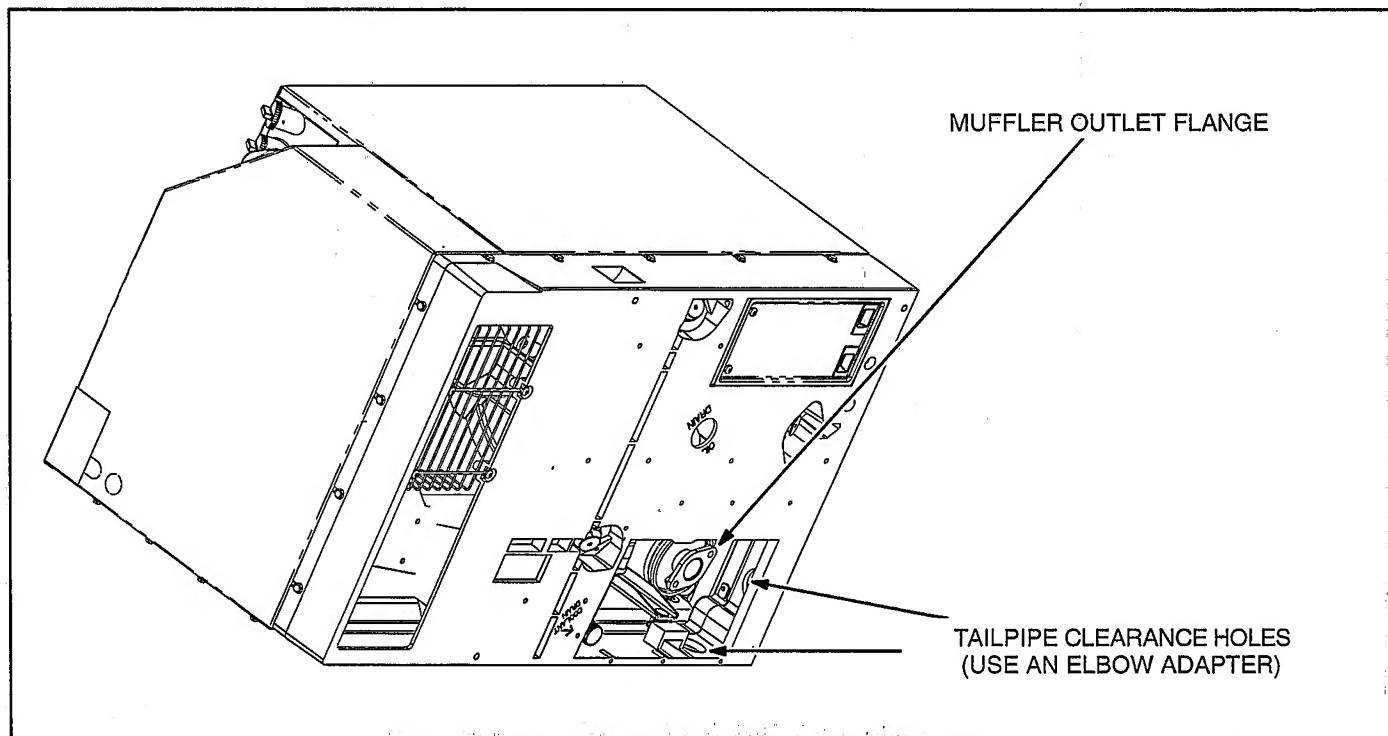
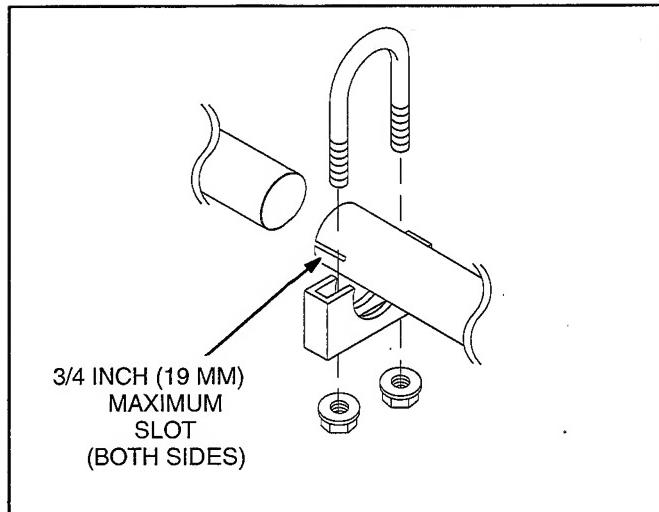
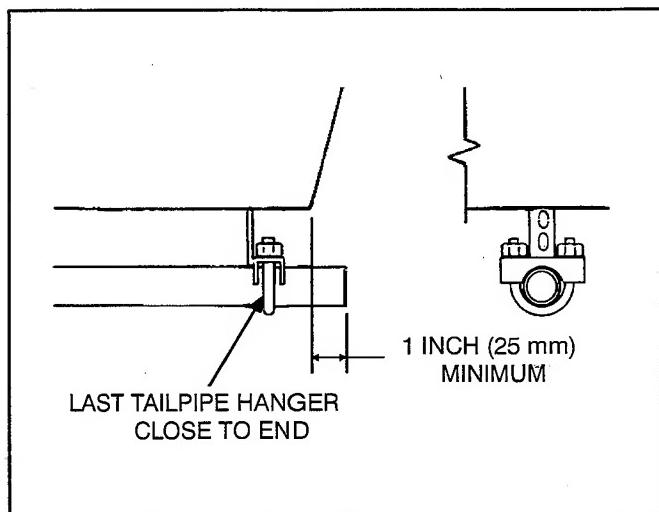


FIGURE 6. EXHAUST CONNECTION AT GENSET

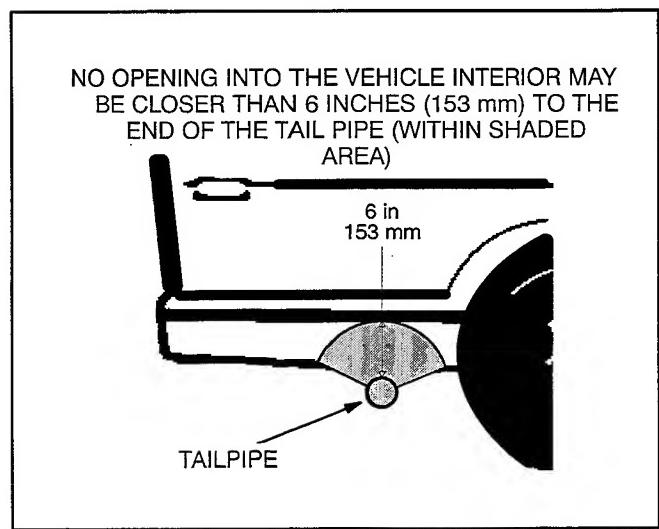
4. Use U-bolt muffler clamps to connect sections of tailpipe. It is recommended that the overlapping pipe be slotted as shown in Figure 7.
5. Use automotive-type tailpipe hangers every 2 to 3 feet (610 to 914 mm). Attach the hangers to steel framework, not to wood or other combustible material.
6. Do not terminate the tailpipe underneath the vehicle. Extend it a minimum of 1 inch (25 mm) beyond the perimeter of the vehicle (Figure 8). Support the end of the tailpipe such that it cannot be pushed inward and up under the skirt of the vehicle.
7. Do not route the tailpipe such that it will interfere with opening the maintenance door or draining engine oil or coolant or restrict the air inlet.
8. Do not route the tailpipe closer than 3 inches (76 mm) to combustible material (wood, felt, cotton, organic fibers, etc.) unless it is insulated or shielded. The temperature rise (above ambient) on adjacent combustible material must not exceed 117°F (65°C).
9. Do not route the tail pipe near fuel lines or fuel tanks.
10. Do not terminate the tailpipe such that it is closer than 6 inches (153 mm) to any opening into the vehicle interior (door, window, vent). See Figure 9.
11. In "high-mount" applications (Model HDKAT), the exhaust tailpipe must be routed down and underneath the vehicle and terminate at least 1 inch (25.4 mm) beyond the perimeter of the vehicle (Figure 8). The tail pipe may be routed inside the hot exhaust duct (Page 10), but not through the interior of the vehicle. The tail pipe must be visible and accessible along its entire length for inspection and replacement.



**FIGURE 7. EXHAUST TAILPIPE CONNECTIONS**



**FIGURE 8. TERMINATING THE EXHAUST TAILPIPE**



**FIGURE 9. MINIMUM DISTANCES TO OPENINGS**

12. Route the tailpipe such that it will not likely be struck when the vehicle is moving. At least keep it out of the approach and departure angles of the vehicle and above the axle clearance line (Figure 10).
13. The exhaust back pressure under full load must not exceed 2 inches (51 mm) water column (WC) as measured within 6 inches (153 mm) of the muffler outlet flange.

**CAUTION** Excessive back pressure can cause loss of performance and engine damage.

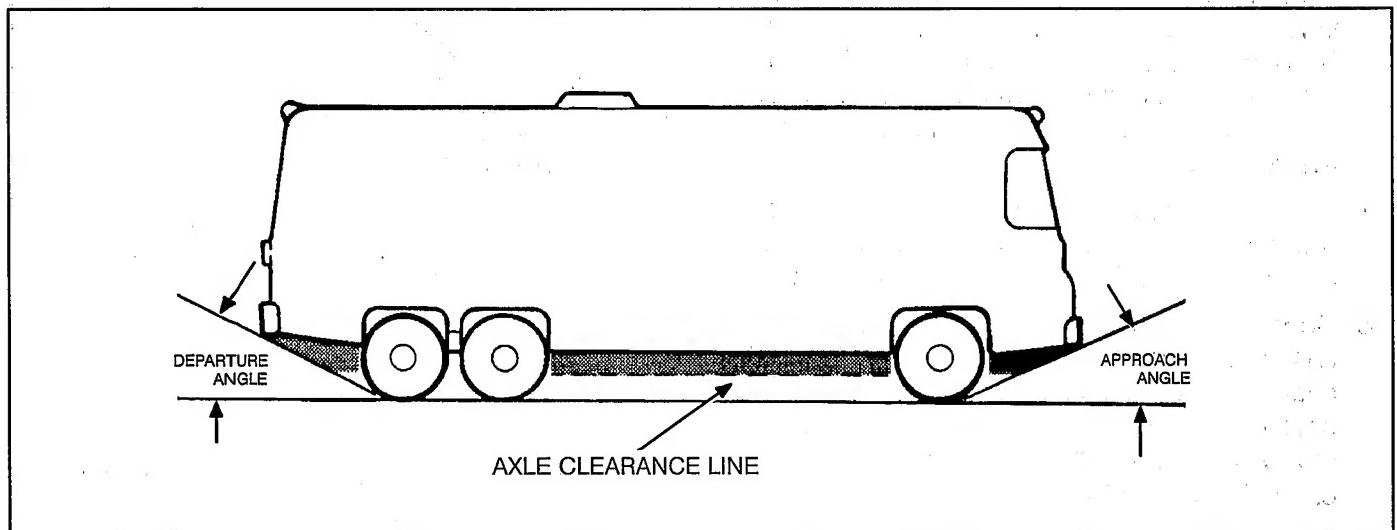


FIGURE 10. APPROACH AND DEPARTURE ANGLES AND AXLE CLEARANCE LINE

# Fuel Connections

**WARNING** Diesel fuel is a combustible and can cause severe personal injury or death. Do not smoke or allow any flame, spark, pilot light, arc-producing equipment, electrical switch or other ignition source around fuel or fuel components, or in areas sharing ventilation. Keep a type ABC fire extinguisher handy.

Do not interconnect genset and vehicle engine fuel lines. Follow the vehicle chassis manufacturer's instructions when making connections to the vehicle engine fuel tank.

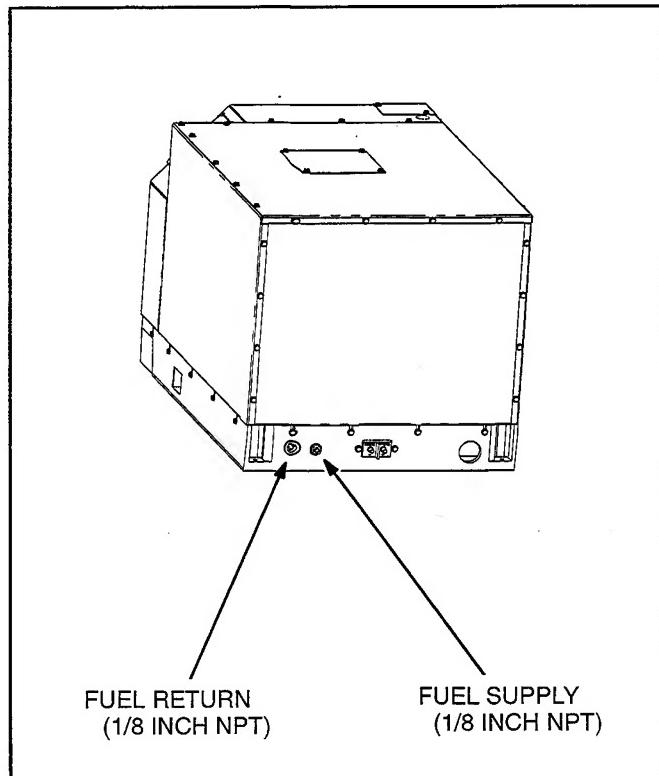
**CAUTION** Either or both engines could starve for fuel if the genset and vehicle engine fuel lines are interconnected. Always use separate fuel lines or a separate fuel tank for the genset.

To prevent the genset from running the vehicle out of fuel, do not extend the genset fuel pickup tube down into the fuel tank as far as the pickup tube for the vehicle engine.

Fuel lines (supply and return) must have at least a 1/4 inch (6.4 mm) ID. See Figure 11 for connections at the genset.

Run the fuel line at or above the top of the fuel tank to reduce the risk of siphoning fuel out of the tank if the line should break. The maximum fuel pump lift is 36 inches (914 mm). An auxiliary fuel pump kit (Kit 541-0530) is available from Onan for generator sets mounted more than 36 inches (914 mm) above fuel source.

Route fuel lines away from electrical wiring and hot engine exhaust components. Fuel lines should be accessible for inspection and replacement, protected from damage and secured to prevent kinking, contact with sharp edges and chafing due to vibration.



**FIGURE 11. FUEL CONNECTIONS**

# Electrical Connections

Do not connect the battery cables to the battery until *Installation Review and Startup* (Page 22) to prevent accidental starting of the genset during installation.

**WARNING** *Accidental starting of the genset can cause severe personal injury or death. Do not connect the starting battery until Installation Review and Startup (Page 22).*

## GENERATOR CONNECTIONS

The genset is equipped with a terminal block and conduit connector knockouts for AC power output connections (Figure 12). See Figure 13 for typical connections.

## Wiring Methods

Follow the National Electrical Code, especially noting the following:

1. Have a qualified electrician supervise and inspect the installation of all AC wiring.
2. Secure only one lead at each AC output terminal. The terminals are suitable for wire sizes up to No. 6 AWG.
3. Install vibration-proof switches and controls that won't open and close circuits when the vehicle is in motion.
4. Provide ground fault circuit interrupters (GFCIs) for all convenience power receptacles.
5. Route AC wiring, remote control wiring and fuel lines separately.
6. Seal all conduit openings into the vehicle interior to keep out exhaust gas. Apply silicone rubber or an equivalent type of sealant inside and outside each conduit connector. (Flexible conduit is not vapor-tight and will allow exhaust gas to enter along the wires if not sealed.)

**WARNING** *EXHAUST GAS IS DEADLY!*  
*Seal all wiring openings into the vehicle interior to keep out exhaust gas.*

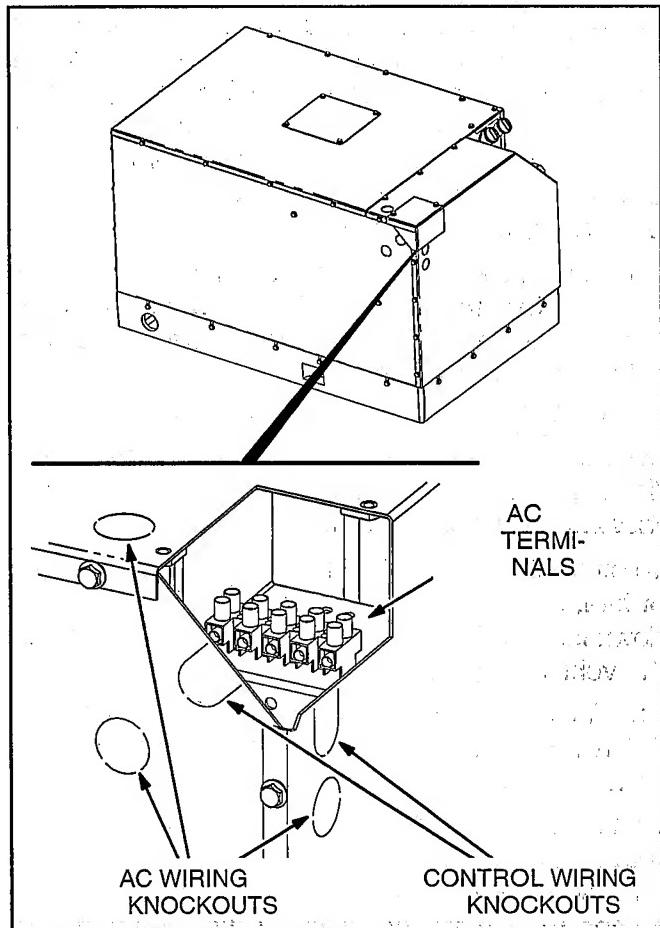


FIGURE 12. AC OUTPUT BOX

7. Bond the genset and all connected AC and DC equipment and controls to a common grounding point in accordance with applicable codes.

**WARNING** *Faulty grounding can lead to fire and electrocution, resulting in severe personal injury or death. Grounding must be in accordance with applicable codes.*

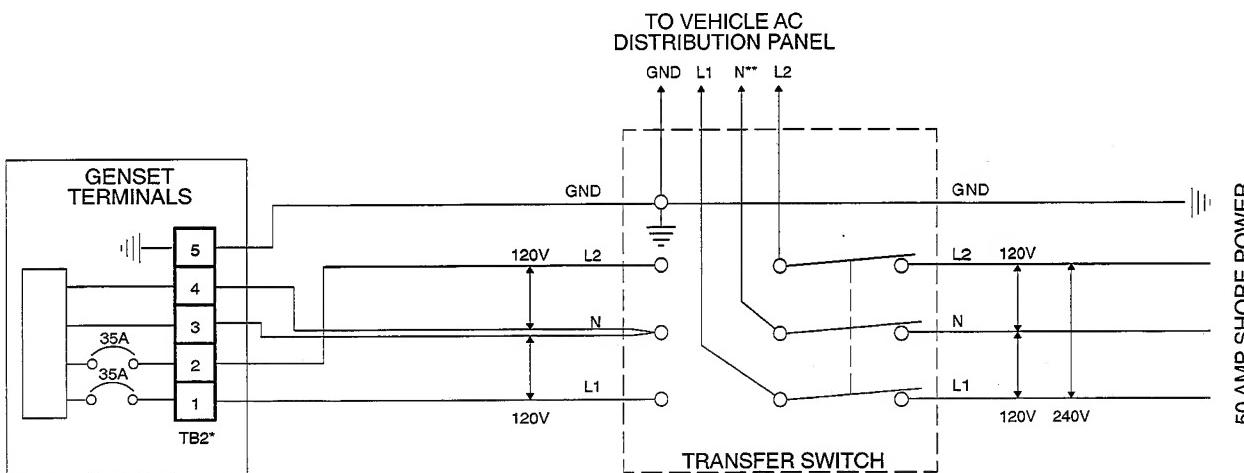
## Connecting the Vehicle to Utility Power

When the vehicle has provision for connecting utility

power it must have an approved device to keep the genset and utility from being interconnected. See Figure 13 for typical connections.

**WARNING** *Interconnecting the genset and the public utility (or any other power source) can lead to the electrocution of personnel working on the utility lines, damage to equipment and fire. An approved switching device must be used to prevent interconnections.*

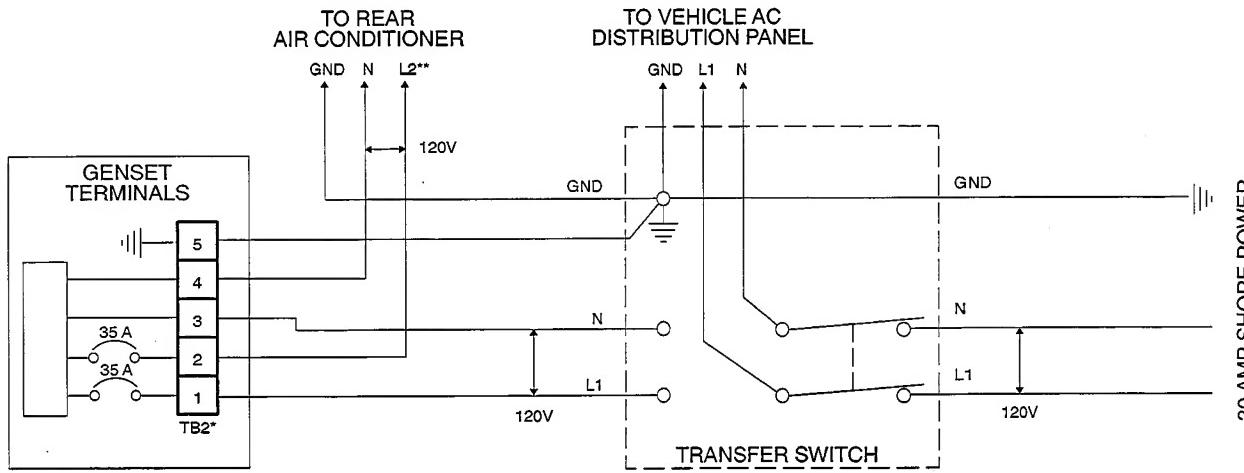
50 AMP SHORE POWER AND TRANSFER SWITCH



\* DO NOT SECURE MORE THAN ONE CONDUCTOR AT ANY TERMINAL ON TB2

\*\* Because L1 and L2 from the genset are in phase, current in the Neutral conductors is the sum of the currents in L1 and L2.  
Wiring and equipment must be sized accordingly.

30 AMP SHORE POWER AND TRANSFER SWITCH AND SEPARATE AIR CONDITIONER CIRCUIT



\* DO NOT SECURE MORE THAN ONE CONDUCTOR AT ANY TERMINAL ON TB2

\*\* This circuit has a 30 or 35 amp circuit breaker. Wiring and equipment must be sized and protected accordingly.

FIGURE 13. TYPICAL CONNECTIONS

## REMOTE CONTROL

Figure 14 shows the 10-pin plug on the end of the remote control leads and typical connections to a remote control panel. The plug and leads are stowed inside the AC terminal enclosure when the genset is shipped from the factory. Harnesses of various lengths with mating receptacles are available separately.

### Wiring Methods

1. Remove the AC terminal access cover and remove one of the control wiring knockouts.
2. Pull out the remote control connector plug, fit the bushing around the connector leads into the knockout slot and secure the access cover.
3. Snap the connector plug and harness receptacle together.
4. If the harness does not have a plug for connections at the control panel, use solder-type butt connectors and heat-shrink insulation tubing to connect to the wiring from the remote panel. Use insulated 18 AWG copper conductors for the wiring from the remote panel.

5. Keep control leads away from AC power leads to reduce the possibility of erratic operation due to induced signals.
6. Seal the hole where the leads enter the interior of the vehicle to keep out exhaust gas. Use silicone rubber or an equivalent type of sealant.

**WARNING EXHAUST GAS IS DEADLY!**  
Seal all wiring openings into the vehicle interior to keep out exhaust gas.

### Remote Control Panels

1. The control switch should be a two-pole, momentary-contact, center-return/center-off type of switch with an indicator light.
2. The engine oil pressure and water temperature gauges should be compatible with the genset. See your Onan dealer for makes and models.
3. The total load connected to P8-F (Switched B+) should not exceed 2 amp.
4. The total load connected to P8-B (Status Light) should not exceed 2 amp.

**Note:** To obtain genset status and diagnostics indication, the remote panel status light must be connected to P8-B—not to P8-F.

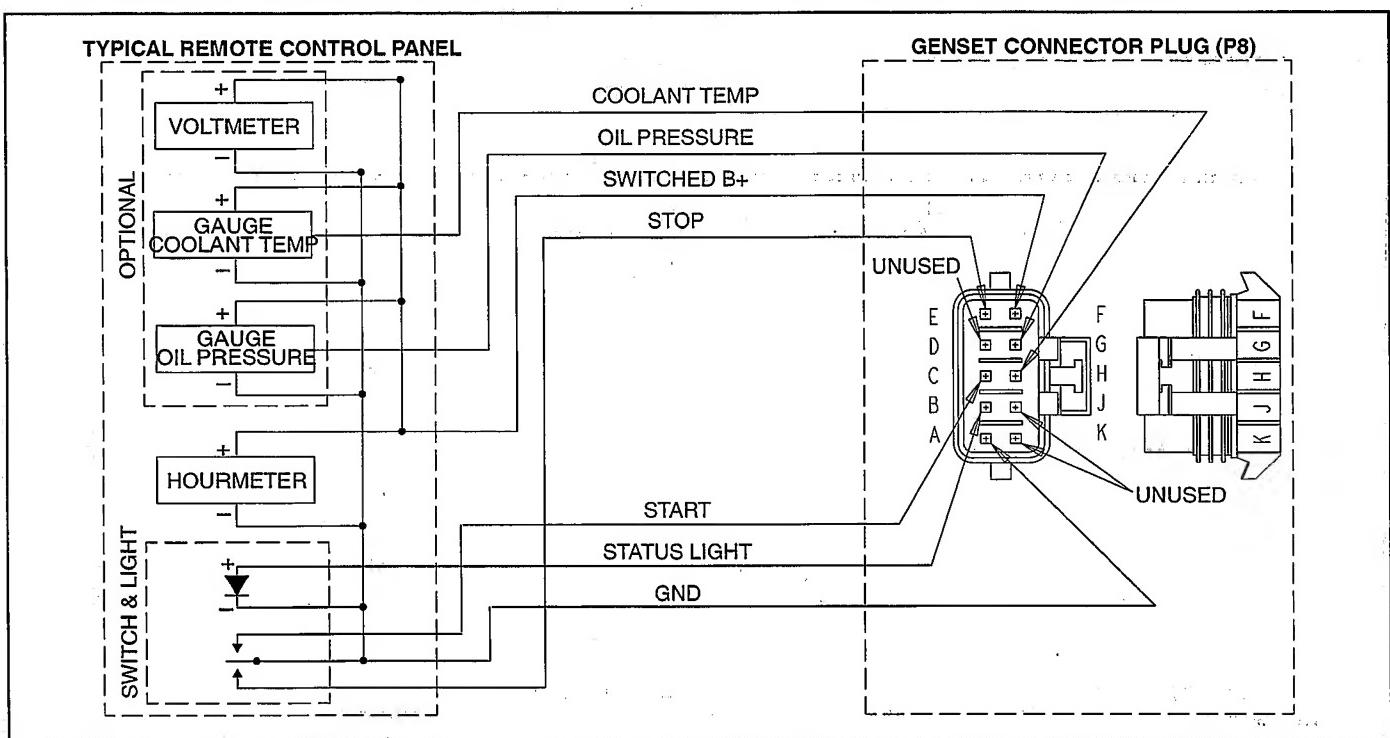


FIGURE 14. REMOTE CONTROL CONNECTOR PLUG AND TYPICAL CONNECTIONS

## BATTERY CONNECTIONS

Do not connect the battery cables to the battery until *Installation Review and Startup* (Page 22) to prevent accidental starting of the genset during installation.

**WARNING** *Accidental starting of the genset can cause severe personal injury or death. Do not connect the starting battery until Installation Review and Startup (Page 22).*

The genset has a 12 VDC, negative-ground engine control and cranking system. See *Specifications* for the requirements for cranking batteries.

### Battery Recharging

The genset is equipped with a 10-amp, regulated-voltage battery charger if electrical option B183 was ordered. If the option was not ordered, other means will have to be provided for recharging the genset battery or batteries.

### Battery Compartment

Batteries must be mounted in a separate compartment from that of the genset and away from spark-producing equipment. A compartment must have openings of at least 1.7 square inches (11 square centimetres) at the top and bottom for ventilation of battery gasses. It should be mounted such that spills and leaks will not drip acid on fuel lines, wiring and other equipment that could be damaged.

**WARNING** *Arcing can ignite the explosive hydrogen gas given off by the battery, causing severe personal injury. The battery compartment must be ventilated and must isolate the battery from spark-producing equipment.*

### Battery Cables

Size battery cables according to Table 2. The current path between the genset and the negative (-) battery terminal must also be able to carry full cranking current without causing excessive voltage drop. It is highly recommended that a full-length cable be used to connect the genset to the negative (-) battery terminal (Figure 15). Note also that codes may require bonding conductors from the genset and the battery to the vehicle frame.

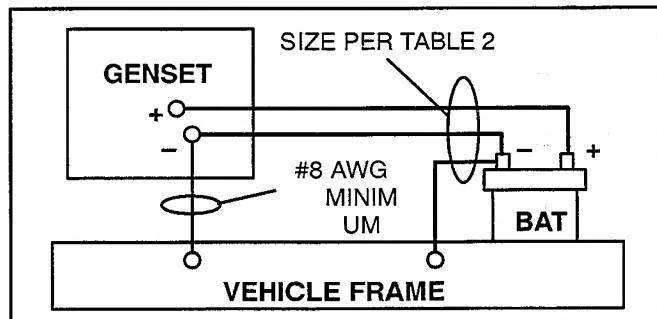
**TABLE 2. BATTERY CABLE SIZES FOR TEMPERATURES DOWN TO -20° F (-29° C)**

TOTAL CABLE LENGTH* FEET (METERS)	CABLE SIZE AWG
0 to 10 (0 to 3)	2**
11 to 15 (3 to 4.5)	0
16 to 20 (4.5 to 6)	000

\* – Add the negative battery cable lengths with the positive battery cable lengths for the total.

\*\* – A total length of up to 20 feet (6 meters) may be used in warmer climates or when battery capacity totals at least 1000 CCA (Cold Cranking Amps).

Alternatively, use rated cranking current as the basis for calculating battery cable size. Rated cranking current for these gensets is 180 amperes at 0° F (-18° C). The cables should be sized so that voltage across the cranking motor terminals will be within 1 volt of the voltage across the battery terminals.



**FIGURE 15. FULL-LENGTH CABLE FROM BATTERY NEGATIVE (-) TERMINAL**

If a full-length negative (-) cable is not run from the battery (Figure 16), all vehicle frame members in the path of battery cranking currents must have substantial crosssections. The electrical resistance of riveted or bolted frame joints must also be carefully considered, especially if the joints will be exposed to corrosive conditions. A cable must be used to connect the frame to the designated negative (-) terminal on the genset (Figure 17). The cable must be sized according to Table 2. ***The genset mounting bolts are not considered adequate means for bonding the genset to the vehicle frame, either for the purpose of carrying cranking currents or for complying with requirements for genset/system grounding.***

Route battery cables away from fuel lines and hot engine exhaust components. Battery cables should be accessible for inspection and replacement, protected from damage and secured to prevent chafing due to vibration.

**WARNING** *Routing battery cables with fuel lines can lead to fire and severe personal injury or death. Keep battery cables away from fuel lines.*

### Genset Bonding Terminal

The negative (-) battery cable terminal shown in Figure 17 is also the bonding terminal for grounding the genset to the vehicle chassis. If the grounding cable is also going to carry starter motor current, it must be sized the same as the battery cables.

### Connecting Battery and Bonding Cables

Before connecting the battery and genset, clearly and permanently mark the polarity of the battery cables. Mark one cable positive (+) on both ends and the other cable negative (-) on both ends. Mark bonding cables negative (-) on both ends.

Making sure the battery cables are **NOT** yet connected at the battery, connect the positive (+) cable to the **POS** terminal on the genset (Figure 17) and the negative (-) cable and bonding cables to the **NEG** terminal on the genset. Connect the battery cables to the battery only at STARTUP (Page 22).

**CAUTION** *Reversing battery connections can lead to battery charger failure (if so equipped).*

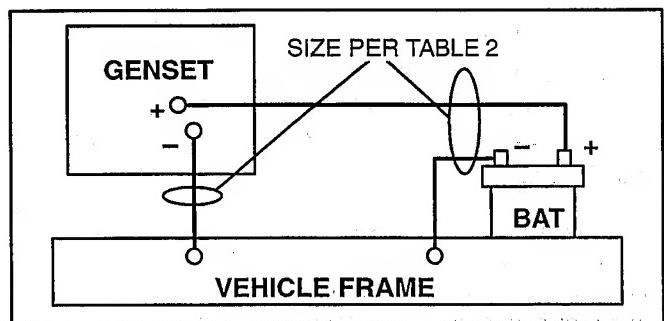


FIGURE 16. VEHICLE FRAME AS PATH FROM BATTERY NEGATIVE (-) TERMINAL

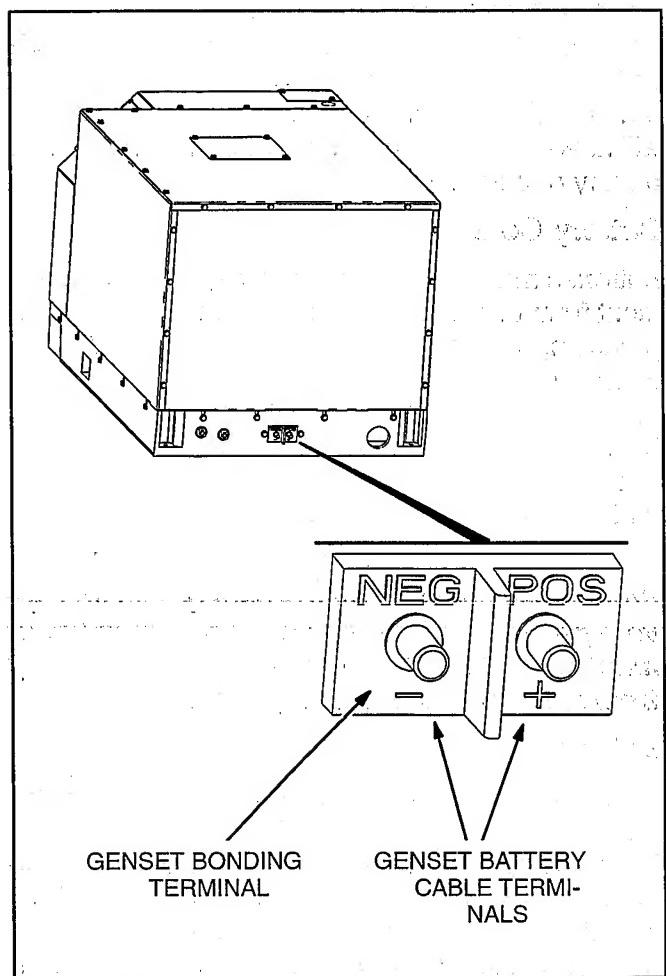


FIGURE 17. BATTERY CABLE CONNECTIONS

# Specifications

	Model HDKAJ / HDKAT	Model HDKAK
<b>GENSET CONTROLLER:</b> Integrated Microprocessor Based Engine and Generator Controller		
<b>GENERATOR:</b> Brushless, Exciterless, Bearingless, Permanent Magnet Alternator		
<b>AC OUTPUT RATINGS:</b>		
Power (@1.0 power factor)	7500 W	8000 W
Voltage	120 volts	120 volts
Frequency	60 Hz	60 Hz
Number of Phases	1	1
Current	62.5 ampere	66.7 ampere
Line Circuit Breaker(s)	One 2-pole, 30 or 35 amp	One 2-pole, 30 or 35 amp
<b>ENGINE:</b> 3-Cylinder In-Line, Water-Cooled, Indirect-Injection, 4-Stroke Cycle Diesel		
Bore	2.64 inch (67 mm)	
Stroke	2.68 inch (68 mm)	
Displacement	44 inch <sup>3</sup> (719 cc)	
Compression Ratio	23 : 1	
Oil Capacity (with filter)*	3 quart (2.6 l)	
Cooling System Capacity**	4.2 quart (4 l)	
Intake and Exhaust Valve Lash (Cold)	0.0065 inch (0.165 mm)	
<b>OPERATING SPEED RANGE:</b>	1600 to 3200 RPM (HDKAJ) 2300 to 3200 RPM (HDKAT)	1600 to 3300 RPM
<b>FUEL CONSUMPTION:</b>		
No-load	.13 gph (.49 l/h)	.13 gph (.49 l/h)
Half-load (4000 W)	.49 gph (1.85 l/h)	.49 gph (1.85 l/h)
Full-load	.96 gph (3.63 l/h)	1.02 gph (3.86 l/h)
<b>DC SYSTEM:</b>		
Nominal Battery Voltage	12 volts	
Minimum Battery Capacity	450 CCA*** down to 0° F (-17° C) 650 CCA*** down to -20° F (-29° C)	
Maximum Regulated-Voltage Battery Charging Current (Optional)	10 ampere	
Fuse F1 (control circuit)	10 ampere mini-bayonet	
Fuse F2 (starter solenoid circuit)	10 ampere mini-bayonet	
Fuse F3 (glow plug circuit)	25 ampere	
<b>WEIGHT AND SIZE:</b>		
Weight (wet)	420 lbs (191 kg)	
Length x Width x Height	36.3 x 23.6 x 22.3 inch (922 x 599 x 566 mm)	
* See oil filling instructions.		
** Includes coolant recovery tank.		
*** Cold Cranking Amps @ 0° F (-17° C)		

# Installation Review and Startup

## INSTALLATION REVIEW

Before starting the genset inspect the installation and check (✓) each of the following questions if it can be answered "YES". If an item cannot be checked, provision must be made to satisfy the requirement.

- [ ] Is the operator's console easily accessible for starting and stopping the genset, resetting circuit breakers, checking and adding engine coolant and oil?
- [ ] Is the genset securely bolted in place?
- [ ] Are all specified clearances provided?
- [ ] Are the air inlet and outlet openings free of obstructions?
- [ ] Does the maintenance access door in the bottom of the genset swing all the way open for fuel and oil filter replacement?
- [ ] Is there easy access for draining engine oil?
- [ ] Is there easy access for draining engine coolant?
- [ ] Are all tailpipe connections tight and all hangers and support straps secure?
- [ ] Does the tailpipe terminate at least 1 inch (25 mm) beyond the perimeter of the vehicle and at least 6 inches (153 mm) away from any opening into the vehicle?
- [ ] Is the genset located outside the vehicle interior or separated by approved vapor-tight and fire-resistive materials?
- [ ] Are all openings into the vehicle, such as for AC wiring, sealed to keep out engine exhaust? Are AC conduit connectors sealed inside and outside?
- [ ] Have all AC connections been inspected and approved?
- [ ] Has a properly sized battery(ies) been installed in a ventilated compartment isolated from the genset?
- [ ] Have properly sized battery cables been installed and secured at sufficient intervals to

prevent chaffing and contact with sharp edges, fuel lines and hot exhaust parts?

- [ ] Is the genset bonding terminal (negative [-] battery cable terminal) properly grounded to the vehicle chassis?
- [ ] Are all fuel connections tight?
- [ ] Has the fuel lines been secured at sufficient intervals to prevent chaffing and contact with sharp edges, electrical wiring and hot exhaust parts?
- [ ] Is the genset protected from direct road splash?
- [ ] Is the genset located or shielded such that condensate from air conditioners will not drip on it?

## STARTUP

When all the items on the Installation Review check list have been checked, connect the battery cables to the battery, positive (+) cable first.

**WARNING Batteries give off explosive gases that can cause severe personal injury. Do not smoke near batteries. Keep flames, sparks, pilot lights, electrical arcs and arc-producing equipment and all other ignition sources well away.**

Read the Operator's Manual and perform the maintenance and pre-start checks instructed. The genset is shipped from the factory with the proper level of engine oil, which should nevertheless be checked before the genset is started. Start and operate the genset, following all the instructions and safety precautions in the Operator's Manual.

**WARNING EXHAUST GAS IS DEADLY! Do not operate the genset when the vehicle is indoors or where exhaust can accumulate.**

Check for fuel, coolant and exhaust leaks and unusual noises while the genset is running under full and intermediate loads. Do not place the genset in service until all fuel and exhaust leaks have been fixed and operation is satisfactory.

## TEMPERATURE TEST

Conducted this test on the first installation representative of a new commercial application of a Model HDKAT genset. Do not continue production until the temperature specifications are met.

### Thermocouples

Measure temperatures with thermocouples not heavier than No. 24 AWG ( $0.21\text{ mm}^2$ ) at the locations shown in Figure 18. When called for, shield the thermocouple with a 2 inch diameter by 6 inch long white PVC pipe or equivalent.

1. Locate a shielded thermocouple in the center of the air inlet opening of the genset to measure inlet air temperature.
2. Locate a shielded thermocouple within 48 inches (1.2 meters) of the inlet air opening and at the same height to measure ambient air temperature. Make sure it is not affected by warm air discharged from the genset.
3. Locate a thermocouple on the oil dip stick to measure oil temperature. The thermocouple should not extend past the ball on the end of the dip stick.

**WARNING** *To prevent severe scalding, always let the engine cool down before removing the coolant pressure cap. Turn the cap slowly, and do not open it fully until the pressure has been relieved.*

4. First relieve coolant system pressure by loosening the coolant pressure cap. Then secure the cap and remove the coolant hose from the thermostat outlet. Secure a thermocouple so that the bead is in the center of the thermostat outlet fitting. Run the leads out between the fitting and hose and secure the hose with a new hose clamp.

### Method

1. Conduct the test at a location where the ambient air temperature will remain between  $60^\circ\text{ F}$  and  $100^\circ\text{ F}$  ( $16^\circ\text{ C}$  and  $38^\circ\text{ C}$ ) during the test.
2. Connect the genset to a load bank that can be adjusted to apply full rated load.

3. Run the genset under full-load, with all service and compartment doors closed, and record temperatures every 15 minutes until they stabilize. Temperature is considered stable when there is no change in three consecutive readings. See Table 3 for an example of how the data can be recorded.

### Temperature Specifications

To determine temperature rises, subtract the ambient air temperature from the other temperatures in the same column in Table 3.

**Inlet Air Temperature Rise:** The rise in inlet air temperature over ambient air temperature must not exceed  $8^\circ\text{ F}$  ( $4.4^\circ\text{ C}$ ).

**Oil Temperature Rise:** The rise in engine oil temperature over ambient air temperature must not exceed  $190^\circ\text{ F}$  ( $106^\circ\text{ C}$ ).

**Maximum Coolant Temperature:** Maximum coolant temperature is  $230^\circ\text{ F}$  ( $110^\circ\text{ C}$ ), at which point the genset will shut down and fault code No. 33—High Engine Coolant Temperature—will be displayed by the status indicator light.

High temperatures and temperature rises indicate that warm discharge air is recirculating back into the genset compartment or that the inlet or outlet air opening is restricted. Find out why and correct as necessary to meet the temperature specifications.

TABLE 3. TEMPERATURE DATA

THERMOCOUPLE LOCATION	TEMPERATURE F° (C°)					
	Time Of Reading					
INLET AIR						
ENGINE COOLANT						
ENGINE OIL						
AMBIENT AIR						

### Power Output Ratings

Maximum genset power (nameplate rating) is 7500 watts in an ambient of  $85^\circ\text{ F}$  ( $29^\circ\text{ C}$ ), but only 6000 watts in an ambient of  $120^\circ\text{ F}$  ( $50^\circ\text{ C}$ )—the maximum operating temperature. Also, continuous operation at up to 80 percent of maximum power (6000 watts) is acceptable.

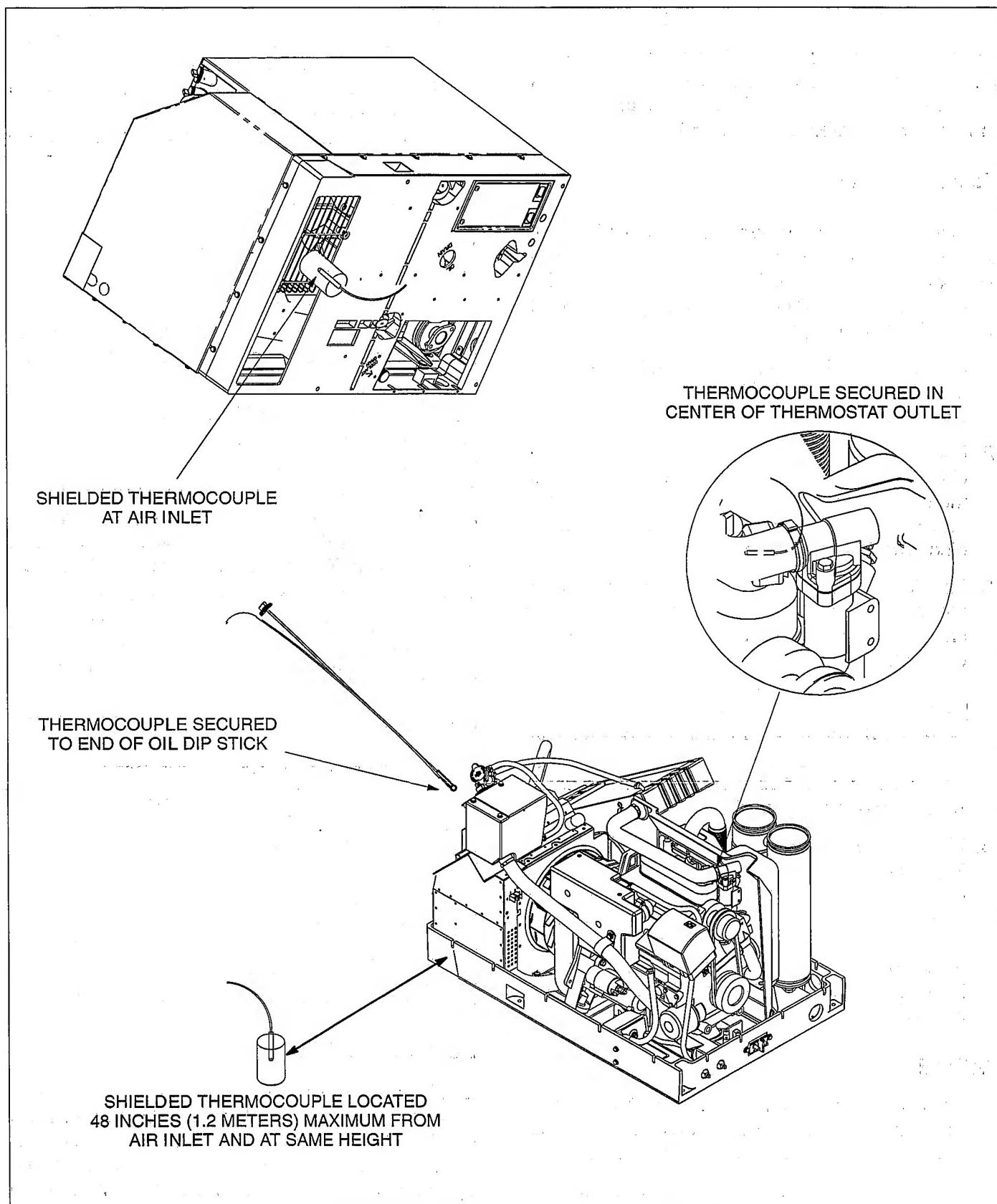


FIGURE 18. THERMOCOUPLE LOCATIONS

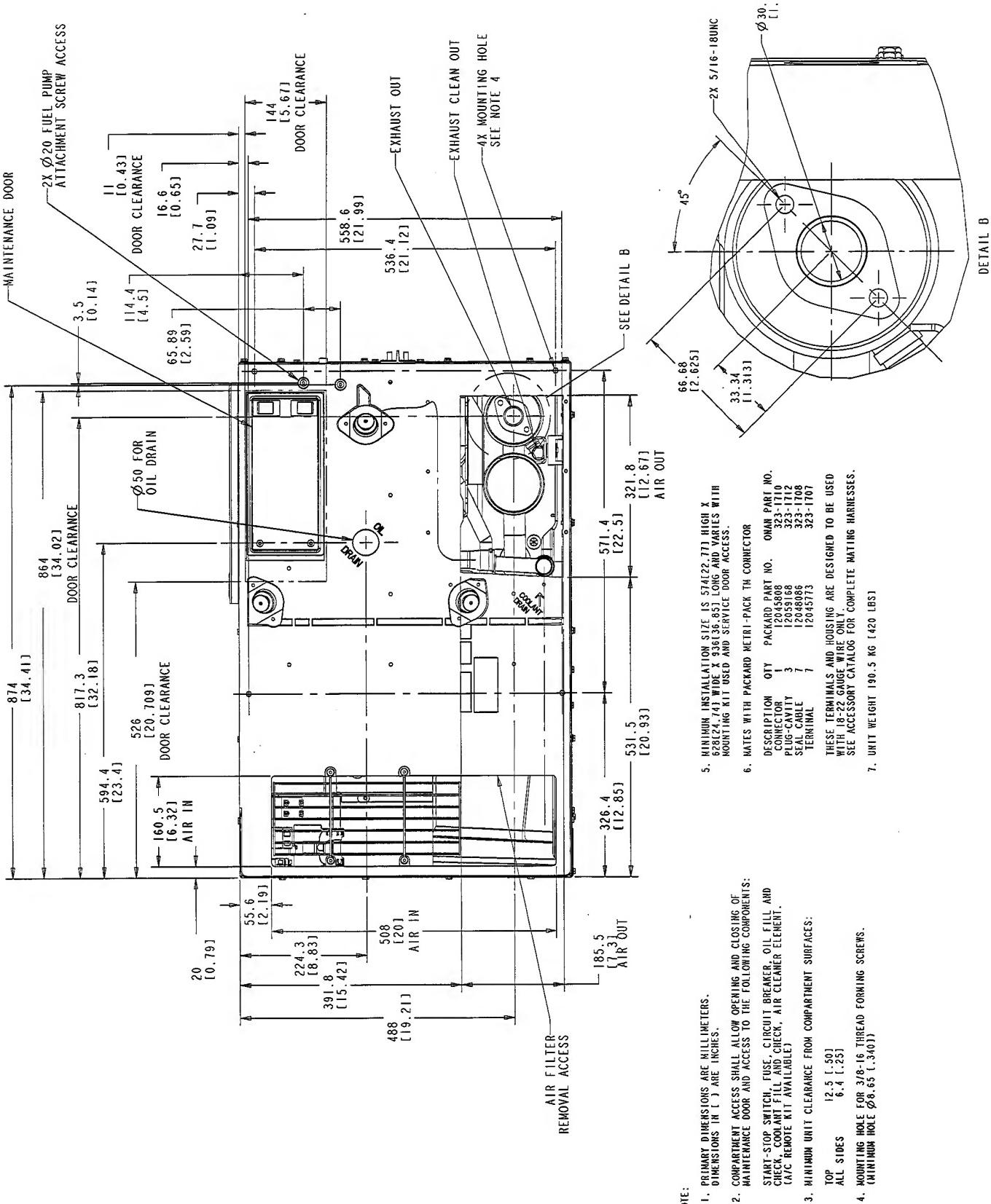
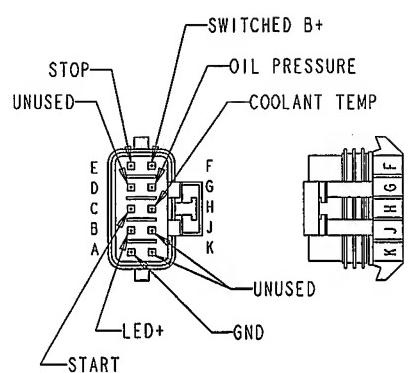
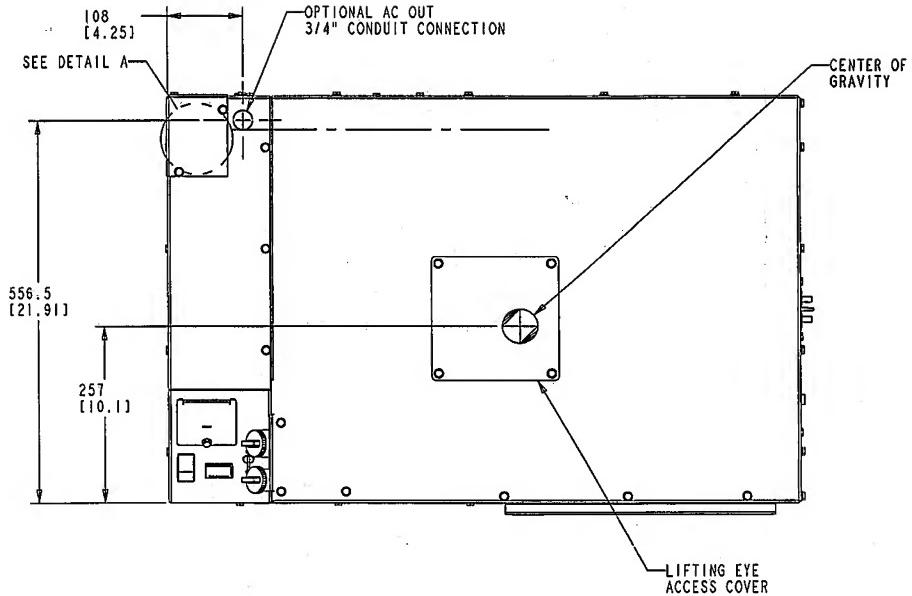
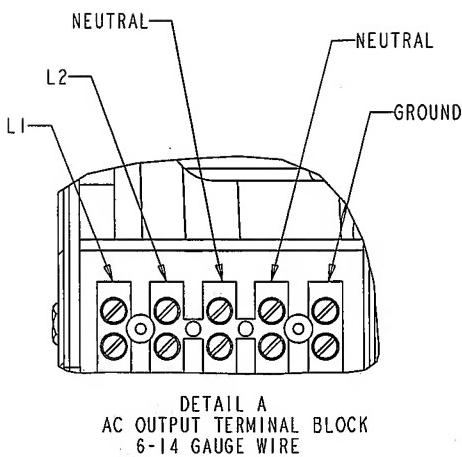


FIGURE 19. OUTLINE DRAWING—BOTTOM (NOT A PLAN VIEW)



REMOTE PLUG DETAIL  
SEE NOTE 6

**FIGURE 20. OUTLINE DRAWING—TOP**

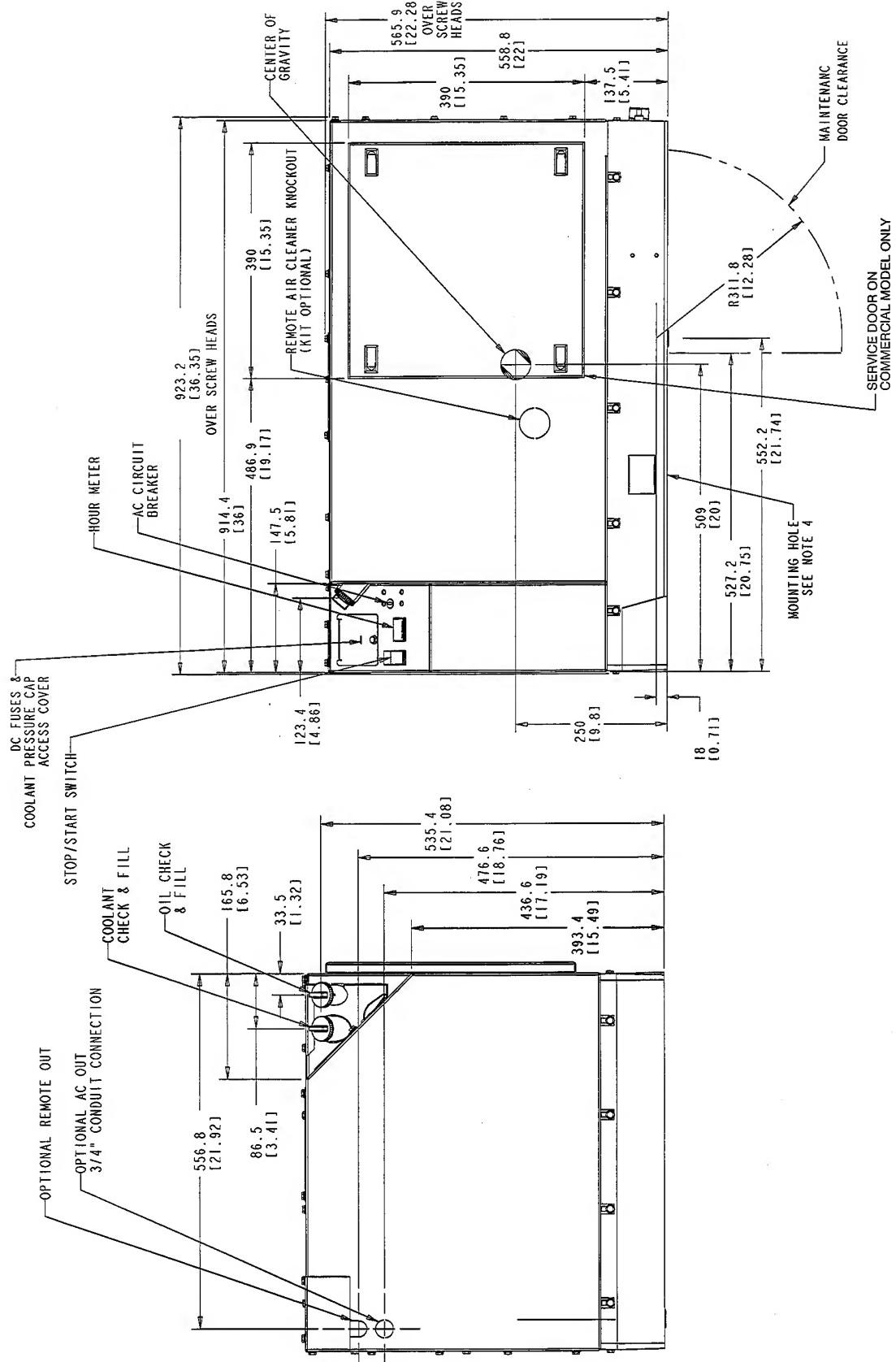
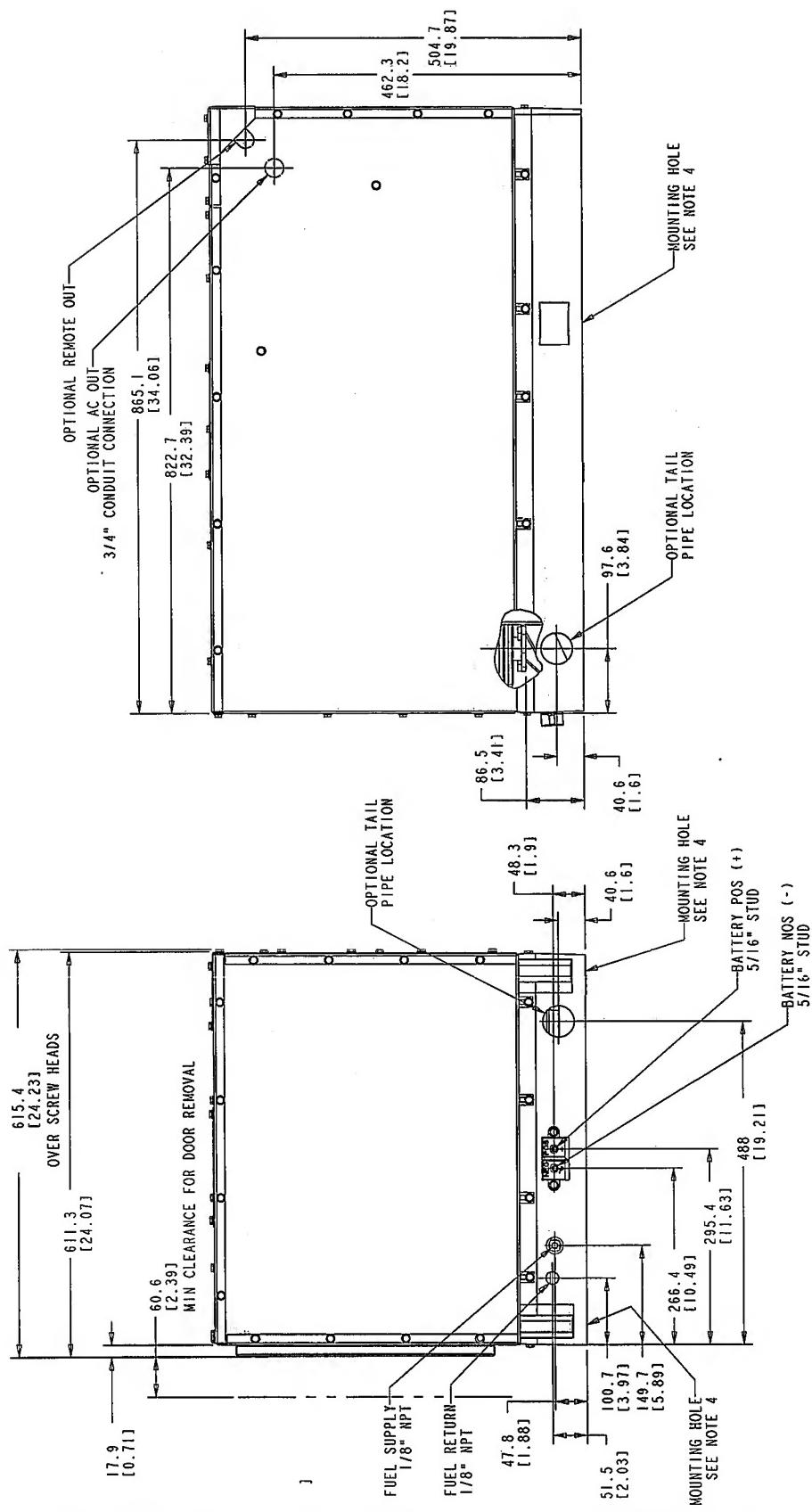


FIGURE 21. OUTLINE DRAWING—FRONT AND LEFT SIDES



**FIGURE 22. OUTLINE DRAWING—RIGHT AND BACK SIDES**





Cummins Power Generation  
1400 73rd Avenue N.E.  
Minneapolis, MN 55432  
763-574-5000  
Fax: 763-528-7229

Cummins and Onan are registered trademarks of Cummins Inc.